

A Workshop on Community Integrated
Environmental Models
May 21-23, 2015 in Davis, California
Project Outcomes Report

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Scientific knowledge on physical, biological and chemical processes has been developed for the San Francisco Bay-Delta estuary watershed and other large vulnerable estuaries around the world. However, the complexity of these systems demands strong connections among discipline-specific models and data.

To advance integration of models and their insights the Center for Watershed Sciences of UC Davis with funding from the National Science foundation CBET Environmental Engineering Program and the California Delta Stewardship Council convened a three-day symposium and workshop on integrated modeling of estuarine systems. A planning committee of 16 members put together the program and major themes for the workshop. Participating organizations in planning included:

- Government Agencies
 - California Department of Water Resources,
 - California State Water Resources Control Board,
 - Environmental Protection Agency,
 - California Environmental Protection Agency
- Modeling organizations
 - California Water and Environmental Modeling Forum
 - International Association Hydroenvironment Engineering and Research
 - University Council on Water Resources

- Academic institutions
 - University of California
 - Stanford University
 - California State University
 - University of Idaho

The event occurred at the University of California Davis from May 20th-22nd, 2015 and brought experts from Europe, Asia and North America to develop a vision for community integrated modeling of estuarine systems. The workshop was open for the general public on the first day with plenary conferences. Overview was provided by research and policy leaders from NOAA, Department of Water Resources, the California Delta Stewardship Council, UC Davis and the National Science Foundation. A set of panels on connecting system processes, reducing science and policy gaps, and looking ahead followed. All the plenary talks are posted in the workshop website (<http://integratedmodeling.ucdavis.edu>).

A select group of demonstrations by model developers from The Nature Conservancy, ESSA (Delta Ecological Flows Tool), 34 North (OPENNRM and Baydeltalive.com), DWR Delta Modeling (SCHISM), UCD HOBBS Framework, Karl Benedict (UNM), Alejandro Flores (Leaf Group BSU) concluded first workshop day during a networking reception. The second day, a select group of researchers, managers, and academics joined by invitation in three roundtable breakouts with facilitators. The last day of the workshop convened the author's team to draft the white paper outline and ideas. The approaches discussed in the workshop included.

- **Community modeling.** Leverage the expertise of many public, private, NGO, and academic researchers for understanding complex environmental problems and supporting adaptive management. Community modeling as a way connect experts on each system component through a common framework. Community modeling requires a sustainable business model that works across agencies, universities, NGOs and the private sector.
- **Public domain models and data.** Open source and more proprietary and controlled approaches to develop software and data are important where a broad common understanding must be developed among many interests and where alternatives must be compared with transparency and minimal cost.
- **Integrated Environmental Modeling (IEM).** Information technologies can help coupling independently developed models. Modular modeling components are assembled to explore, explain, and forecast the behavior of various system purposes. IEM systems around the world include diverse stand-alone applications and high performance computer clusters

The first draft of the paper is published in the project's website along with some additional background papers and workshop information. The workshop included about 150 people the first day from more than 50 organizations.

The workshop author's group conceptualized a Delta Modeling Collaboratory to realize the promise of models and data for decision support. Summary points below outline how the collaboratory approach could will improve science, integrated modeling and policymaking in estuarine systems such as California's Sacramento San Joaquin Delta.

1. Establishment of an open University-Agency-NGO-Private Delta Modeling Collaboratory to implement activities in a long term management plan.
2. Manage the Collaboratory through the University of California in partnership with agencies, other academic institutions, NGOs and private entities.
3. Have problem-based groups of modelers convene at the Collaboratory to discuss technical issues and develop tools for policy making.
4. Have a physical location for the Collaboratory with some meeting space and a virtual network for computing capabilities.
5. Provide a with minimal staff to maintain networking and collaboration capabilities at the physical location.
6. Structure the Collaboratory to be able to contract and receive funding with minimal barriers.
7. Provide training classes at the Collaboratory and staff support
8. Include provisions for making access and availability of models possible through the basic infrastructure of the Collaboratory.
9. Develop business models to foster commitment and engagement from participants. Support conceptual models and facilitate their updates.

Further outreach products include submission of a manuscript to the *San Francisco Estuary and Watershed Science Journal* and participation in professional venues in promoting the vision of the Delta Modelling Collaboratory.